

What is claimed is:

1. An apparatus for injecting synchronized stream data for a digital data broadcasting service, comprising:

5        an additional data storing means for storing, managing and outputting additional data used for the digital data broadcasting service;

10        a synchronized stream data selection/establishment means for selecting synchronized stream data to be multiplexed with a video/audio transport stream, which is inputted from the outside, among the additional data stored in the additional data storing means, and establishing parameter values necessary to multiplex the selected synchronized stream data and the video/audio transport stream;

15        a synchronized stream data analyzing means for analyzing the selected synchronized stream data periodically based on the parameter values established in the synchronized stream data selection/establishment means, and generating information related to the transport stream of the synchronized stream data;

20        a transport stream analyzing means for analyzing the video/audio transport stream periodically based on the parameter values established in the synchronized stream data selection/establishment means, and generating information related to the video/audio transport stream;

25        a synchronized stream data injection/management means for determining whether to inject a data access unit (DAU) that

forms the synchronized stream data or not based on the information related to the synchronized stream data transport stream generated in the synchronized stream data analyzing means and the information related to the video/audio transport stream generated in the transport stream analyzing means, and controlling the output of the DAU that forms the synchronized stream data which are stored in the additional data storing means;

a presentation time stamp re-stamping means for re-stamping the presentation time stamp of the synchronized stream data which are outputted from the additional data storing means based on the parameter values established in the synchronized stream data selection/establishment means; and

a multiplexing means for multiplexing and outputting the video/audio transport stream and the synchronized data outputted from the presentation time stamp re-stamping means.

2. The apparatus as recited in claim 1, wherein the parameter values established in the synchronized stream data selection/establishment means include at least any one selected from a group having a new presentation time stamp of a first DAU of the synchronized stream data; an injection period, which is a time interval for analyzing the video/audio transport stream and synchronized stream data and injecting the synchronized stream data to the video/audio transport stream; and the number of analyzed DAU within the analyzed synchronized stream data during the above established

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injection period.

3. The apparatus as recited in claim 1, wherein if the number of analyzed DAU is not established in the synchronized stream data selection/establishment means, the synchronized stream data selection/establishment means calculates the number of analyzed DAU by multiplying the largest value (59, 94 or 60) of the number of frequency of DAU generation to the established injection period, and if the injection period and the number of analyzed DAU are not established in the synchronized stream data selection/establishment means, the injection period and the number of DAU to be injected are determined to be 50 msec and 3, respectively.

4. The apparatus as recited in claim 1, wherein if synchronized stream data synchronized with the video/audio transport stream are not stored in the additional data storing means, the synchronized stream data selection/establishment means receives the synchronized stream data from the outside and stores the synchronized stream data in the additional data storing means.

5. The apparatus as recited in claim 1, wherein the synchronized stream data analyzing means obtains as many DAU as the analyzed DAU by analyzing the synchronized stream data selected in the synchronized stream data selection/establishment means based on the injection period and the

number of analyzed DAU established in the synchronized stream data selection/establishment means, and obtains the presentation time stamp of a corresponding DAU and the number of transport stream packets.

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6. The apparatus as recited in claim 1, wherein the transport stream analyzing means analyzes the video/audio transport stream periodically based on the injection period established in the synchronized stream data selection/establishment means, and obtains the program clock references (PCRs) of the beginning part and the final part of the analyzing section of the video/audio transport stream analyzed during one injection period.

15 7. The apparatus as recited in claim 1, wherein in order to calculate PCR of the transport stream, the transport stream analyzing means directly obtains a PCR value from a transport stream including PCR within the analyzing section, obtains PCR from the transport stream packets including PCR among the inputted MPEG-2 transport streams by calculating the PCR for another transport stream packet using an output rate of the MPEG-2 transport stream, or by having a reference clock that increases at 27MHz which is a per-second increase of PCR of the transport stream analyzing means, and obtains the PCR value by establishing the value of the reference clock with the same value as the obtained PCR and then obtaining the value of the reference clock at a moment when the PCR value is

needed.

8. The apparatus as recited in claim 1, wherein the synchronized stream data injection/management means calculates the presentation time offset value by using the difference between the new presentation time stamp of a first DAU of the synchronized stream data established in the synchronized stream data selection/establishment means and the presentation time stamp of the first DAU of the synchronized stream data obtained in the synchronized stream data analyzing means, calculates a new presentation time stamp of DAU of the synchronized stream data by adding the presentation time offset value to the presentation time stamp of DAU of the synchronized stream data obtained periodically in the synchronized stream data analyzing means, compares the calculated new presentation time stamp with the PCR generated periodically based on the injection period, which is established in the synchronized stream data selection/establishment means, in the transport stream analyzing means, and if the new presentation time stamp of DAU is larger than the PCR in the final part of the video/audio transport stream currently analyzed and smaller than the summation of the PCR increase during one period and the PCR of the final part, determines to inject the corresponding DAU, and controls the additional data storing means to output the corresponding DAU.

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9. The apparatus as recited in claim 1, wherein if a new presentation time stamp for the first DAU is stamped in the synchronized stream data selection/establishment means, the presentation time stamp re-stamping means receives  
5 synchronized stream data outputted from the additional data storing means, re-stamps the presentation time stamp of DAU that forms the synchronized stream data by referring to the presentation time stamp newly stamped in the synchronized stream data selection/establishment means, and outputs the re-  
10 stamped presentation time stamp of DAU to the multiplexing means,

and wherein, to re-stamp the presentation time stamp of all DAU that form the synchronized stream data, the presentation time stamp re-stamping means calculates the  
15 presentation time offset value by using the difference between the presentation time stamp of the first DAU of the synchronized stream data and the new presentation time stamp stamped in the synchronized stream data selection/establishment means, and re-stamps the presentation  
20 time stamp of all DAU that form the synchronized stream data by adding the presentation time offset value to the presentation time stamp of all DAU that form the synchronized stream data.

25 10. The apparatus as recited in claim 1, wherein the multiplexing means injects the DAU of the synchronized stream data outputted from the presentation time stamp re-stamping

means into the places of null packets in the video/audio transport stream within a section analyzed in the transport stream analyzing means, instead of the null packets.

5           11. The apparatus as recited in claim 1, wherein if the number of DAU multiplexed in the video/audio transport stream analyzed in the transport stream analyzing means is more than two, the multiplexing means injects the DAU into the video/audio transport stream in the order of quick  
10 presentation time stamp, and the locations for DAU to be injected into are moved from a part where PCR of the analyzed video/audio transport stream is small to a part where PCR of the analyzed video/audio transport stream is large.

15           12. A method for injecting synchronized stream data for a digital data broadcasting service, comprising the steps of:

          a) selecting synchronized stream data that are synchronized with a video/audio transport stream supplied from the outside among additional data used for the digital data  
20 broadcasting service, and establishing an injection period which is a time interval for analyzing the video/audio transport stream and the synchronized stream data and injecting the synchronized stream data, the number of analyzed DAU which is the largest number of DAU that can be injected  
25 into the video/audio transport stream during the above established injection period, and a new presentation time stamp of a first data access unit (DAU) of the synchronized

stream data;

b) obtaining the presentation time stamp of a corresponding DAU and the number of transport stream packets by analyzing the selected synchronized stream data periodically based on the injection period and the number of analyzed DAU which are established in the step a), and obtaining as many DAU as the analyzed DAU;

c) obtaining PCR information of the video/audio transport stream within the analyzing section by analyzing the video/audio transport stream periodically based on the injection period determined in the step a);

d) determining whether to inject the DAU of the synchronized stream data into the video/audio transport stream within the analyzing section or not based on the new presentation time stamp of the first DAU of the synchronized stream data, presentation time stamp of DAU of the synchronized stream data and the PCR information of the video/audio transport stream;

e) if the DAU of the synchronized stream data is to be injected into the video/audio transport stream within the analyzing section, re-stamping the presentation time stamp of DAU of the synchronized stream data by using the new presentation time stamp of the first DAU of the synchronized stream data; and

f) injecting the DAU of the synchronized stream data whose presentation time stamp is re-stamped newly into the video/audio transport stream and outputting the video/audio



transport stream with the DAU.

13. The method as recited in claim 12, further comprising the step of:

5       g) going back to the step b) if the section does not satisfy the condition for injecting the DAU.

14. The method as recited in claim 12, further comprising the step of:

10       h) determining whether all of the DAUs of synchronized stream data are injected or not, and going back to the step b) if there is any of the DAUs to be injected, go to step b).

15       15. The method as recited in claim 12, wherein the step a) includes the steps of:

      a1) if the number of analyzed DAU is not established, calculating the number of analyzed DAU by multiplying the largest value (59.94 or 60) of the number of frequency of DAU generation to the injection period established above; and

20       a2) if the injection period and the number of analyzed DAU are not established, determining the injection period and the number of analyzed DAU to be 50 msec and 3, respectively.

25       16. The method as recited in claim 12, wherein the PCRs of the beginning part and the final part of the analyzing section of the video/audio transport stream analyzed during one injection period are obtained by analyzing the video/audio

transport stream periodically based on the injection period.

17. The method as recited in claim 12, wherein said step d) includes the steps of:

5       d1) calculating a new presentation time stamp of the DAU based on the new presentation time stamp of a first DAU of the synchronized stream data established in the step a) and the presentation time stamp of DAU of the synchronized stream data which are obtained periodically at the step b);

10       d2) comparing the new presentation time stamp of DAU with the PCR information of the video/audio transport stream obtained in the step c);

15       d3) if the new substantial presentation time stamp of DAU is larger than a base value PCR\_base of the PCR of the video/audio transport stream and smaller than a summation value of increase of the base value PCR\_base during one injection period and the base value PCR\_base of the PCR of the video/audio transport stream, deciding a time to inject the DAU of the synchronized stream data into the video/audio  
20       transport stream.

18. The method as recited in claim 17, wherein the step d1) includes the steps of:

25       d1-1) calculating a presentation time offset value by using the difference between the new presentation time stamp of the first DAU of the synchronized stream data established in the step a) and the presentation time stamp of the first

DAU of the synchronized stream data obtained in the step b);  
and

d1-2) calculating the new presentation time stamp of the  
DAU of the synchronized stream data by adding the presentation  
5 time offset value to the presentation time stamp of DAU of the  
synchronized stream data.

19. The method as recited in claim 12, wherein the step  
e) includes the steps of:

10 e1) checking if a new presentation time stamp for the  
first DAU of the selected synchronized stream data is  
established;

e2) if a new presentation time stamp for the first DAU of  
the selected synchronized stream data is established,  
15 calculating the presentation time offset value by subtracting  
the presentation time stamp of the first DAU of the actual  
synchronized stream data from the new presentation time stamp,  
or otherwise, terminating the process of re-stamping the  
presentation time stamp; and

20 e3) adding the calculated presentation time offset value  
to the actual presentation time stamp of all DAU of the  
inputted synchronized stream data.

20. The method as recited in claim 19, wherein the step  
25 e) further includes the step of:

if a new presentation time stamp for the first DAU of the  
selected synchronized stream data is not established,

returning to the step f).